in compression by tensile elements. For example, a push rod is replaced by a "pull wire." The arrangement is illustrated diagrammatically in Figure 18, with camshaft 1256 actuating rocker arm 1257 fixed at pivot 1258 which, via tensile member 1259, activates rocker 1260 anchored at pivot 1261, which in turn activates valve 1262 and spring 1263. It is clear that the use of tensile members permits greater freedom in location of cam and valve mechanism, since the line of force need no longer be a straight path. By way of example, tensile element 1259 is shown routed clear of another engine element 1264 by means of wheel, roller or bearing 1265. The rocker arrangement of Figure 18 can be eliminated, as shown in Figure 19, by attaching the tensile member 1259 to a movable cage 1266 surrounding the cam 1267, the cage having a cam follower 1268 (shown by way of example as a roller bearing) and ((~~guide~~)) slot 1269 (((~~shown schematically by way of example as a flange slidable in a slot, the latter not illustrated~~))) moveable on a fixed cylindrical guide 1269a, for defining follower movement relative to cam in the direction indicated by arrow 1270.

A selected embodiment of the engine is illustrated schematically in Figure 20. It consists of a piston 1001 reciprocating between two combustion chambers 1002 at each end of a cylinder 1003 closed by two heads 1004, with a crankshaft 1006 outboard each head, the piston being connected by tensile members 1007 to both crankshafts. Optionally, the crankshaft will also function as a camshaft, actuating valves and optionally providing fuel delivery. The liquid elements for the charge may be delivered to the combustion chambers under pressures and temperatures higher than normal in conventional engines. The cylinder is at least partially surrounded by an exhaust gas processing volume 1008, with exhaust gas being conducted to the volume by alternate paths 1005 and 1009. Intake to the combustion chamber is via the crankcase. Surrounding the engine is a heavily thermally insulated casing 1010, here functioning as structure enclosing volume 1008. This configuration is suitable for four and two stroke embodiments, consuming fuel ranging from gasoline and similar lightweight fuels through diesel and heavier oil fuels to coal and other slurries or powders. Any engine lubrication and / or bearing system may be employed, but optionally either gas or roller needle bearings are used, perhaps with water or other liquids, in the case of water preferably when the components are of ceramic material, as described later. The crank assembly is preferably so designed that any air bearings at least partially operate at a pressure equivalent to the charge pressure of forced induction, in the case of turbocharged, supercharged or force-aspirated engines. In the case of two stroke engines, the preferred arrangement is to exhaust gases via ports about the center of the cylinder. In the two cycle form illustrated schematically in Figure 21, pressurized air is ducted via crankcase 1275 and valve 1276, actuated optionally by combined crankshaft / camshaft 1277, to combustion chamber 1288 (fuel injection system not shown), displacing exhaust gas which exits the chamber via ports 1289 to circumferential exhaust gas processing volume 1290. Insulation 1010 extends around the engine of Figure 20, and is shown around the crankcases and engine of Figure 21. In another example of either a two- or four-stroke engine, Figure 22, the ((~~cylinder~~)) schematically shown piston / cylinder module 1271 is linked to a single crankshaft 1272 by tensile elements 1273 routed about guides / bearings / rollers and / or wheels 1274.

The layout described above may be arranged in multiple cylinder form in a flat configuration, as is shown in plan Figure 23, longitudinal section Figure 24 and cross section Figure 25, where five piston / cylinder modules 1271 with ((~~cylinders and~~)) ten combustion chambers are

arranged about two crankshafts 1006 in two crankcases 1277, connected at one end to the transmission 1011 and optionally mechanically linked by it, and at the other end driving ancillary systems ((~~1275~~)) 1269 (such as a turbocharger) ((~~and optionally linked by member~~)) with the crankshafts optionally mechanically linked by system 1012. The space surrounding the cylinders can be used as an exhaust processing volume 1290, as shown in Figure 21. Figures 23 through 25 have been dimensioned in terms of unit d, in this case and being both the bore and the stroke of the piston. As previously, in following Figures 26 through 32, there are indicated schematically twin combustion chamber piston / cylinder modules at 1271, optionally thermally insulated engine casings at 1010, crankshafts or their axes at 1006, mechanical linkages for multiple crankshafts at 1012, spaces for ancillary systems or transmissions at 1275. In an alternative configuration, shown in schematic longitudinal section Figure 26 and cross-section 27, a double row ten cylinder engine is shown. Obviously, any number of rows and cylinders can be combined between two crankshafts, since it is only necessary to lengthen the tensile elements. In Figure 28 and 29, a schematic cross-section of a four row engine of eighteen cylinders and thirty-six combustion chambers is shown, where tensile members 1013 and 1014 are of unequal length. (In the embodiment of Figure 29, the outer pistons would normally have a shorter stroke than the inner pistons.) Either separate camshafts or more elaborate valve / fuel activation linkages are required, to provide valve actuation or fuel delivery for engines having three or more rows of cylinders and two crankshafts. Alternatively, more than two crankshafts can be employed, as shown diagrammatically in cross-section Figure 31 and longitudinal section Figure 30, in the case of a six row forty-two cylinder, eighty-four combustion chamber engine. It will be noted that these configurations are most practical if the engines are un-cooled or adiabatic. If the tensile members are replaced by connecting rods, a single crankshaft may be used, as shown diagrammatically in Figure 32 for a two row engine, having twin-combustion-chamber cylinder modules 1271, a single combined crank / camshaft 1015 and two camshafts 1016, various valve actuation rods 1276. Figures 23 through 32 are all schematic and do not show valve guides and springs, fuel delivery and exhaust systems, etc.

The basic cylinder modules may be combined to form a "ring" engine with the interior space optionally used for a turbine or ram jet engine to form a compound engine having a single revolving system. Schematic sections Figures 33 and 34 show three rings between outer casing 401 and inner casing 402, each of four piston /cylinder modules ((~~1271~~)) 403 linked by common crankshafts ((~~1272~~)) 404 and tensile members 405, with hot exhaust gases ((~~1280~~)) 406 providing at least partial energy for the ramjet or turbine ((~~1279~~)) 407, either directly or via heat exchangers (not shown). Ambient air flow is shown at 410. The work from the reciprocating portion of the engine - shown at zone 408 - may be used conventionally, may power the compressor of the turbine portion or may, as shown schematically at ((~~1281~~)) 409, drive a fan, propeller or Archimedes screw to provide thrust, either through air or water.

Amend the five paragraphs starting "The issue of the tensile link . . ." on page 16 as follows:

The issue of the tensile link between piston and crank is more complex than is immediately apparent. In the twin crankshaft layout described previously, it is not possible to maintain a constant length between piston and crank, if the cranks are to rotate synchronously.